

## ABSTRACT OF THE DISCLOSURE

Methods and apparatus for non-contact thermal measurement which are capable of providing sub micron surface thermal characterization of samples, such as active semiconductor devices. The method obtains thermal image information by reflecting a light from a surface of a device in synchronous with the modulation of the thermal excitation and then acquiring and processing an AC-coupled thermoreflective image. The method may be utilized for making measurements using different positioning techniques, such as point measurements, surface scanning, two-dimensional imaging, and combinations thereof. A superresolution method is also described for increasing the resultant image resolution, based on multiple images with fractional pixel offsets, without the need to increase the resolution of the image detectors being utilized. The thermoreflective method provides a spatial resolution better than current infrared cameras, operates within a wide temperature range, and is capable of a thermal resolution on the order of  $10\text{ mK}^\circ$ .